LUBRICATION

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We invite correspondence from all those interested.

Those who fail to receive LUBRICATION promptly, will please notify us at once and will confer a favor by promptly reporting change of address.

C. C. C.

On opening this number of *Lubrication*, we suggest that you turn to the last page. Read the little story about the Crater Compound Club. It will give you an interesting glimpse of the human side of our business.

The "boys" are all enthusiastic about Crater Compound, and frequently, outsiders have expressed surprise over the fact that a selling organization could be so enthusiastic over an ordinary grease.

But that's just the point.

Texaco Crater Compound is not an "ordinary grease." It stands alone, high above anything now on the market for the purpose. The "boys" rate Texaco Crater Compound so highly, because it is a splendid leader; once we get a new consumer to try "Crater" he is ours. The results are so fine that he is willing to give the rest of the line a trial. That trial results in the purchase of more Texaco Lubricants.

It may interest you to note the increased service which is available to customers from the meetings of the Crater Compound Clubs, their trips to plants of all kinds, and the exchange of ideas and experiences.

Thus each man benefits by the experiences of all the rest. It makes him a better salesman, gives him a broadened and more accurate viewpoint on your problems.

It enables the whole organization to be of greater service to you.

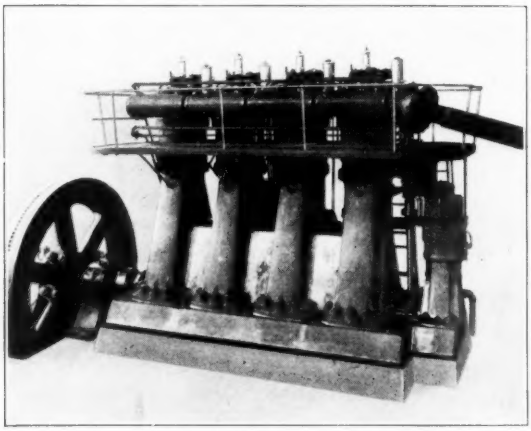
In this number, on page 5, you will find an article on "Temperature Considerations in Oil Testing." We would like to call to your attention the importance of this article, and the related articles which have preceded, and which will follow this number. It will be worth your while to save your copies of *Lubrication*, as a complete file may, at some future date, be of value in clearing up some points on the testing and properties of oils. In passing, we would say that our previous articles on "Viscosity" and on "Flash and Fire," have attracted some little attention. A technical journal of high standing has requested the right to reprint the latter.

When reading the article by Mr. John W. Clark on the Diesel Type Engine, remember our special study of this type, and our success in lubricating Diesels of all kinds.

If you like "new" *Lubrication* tell us—it helps considerably. Likewise, if you don't like it—and why.

THE McINTOSH & SEYMOUR DIESEL TYPE OIL ENGINE

By John W. Clark



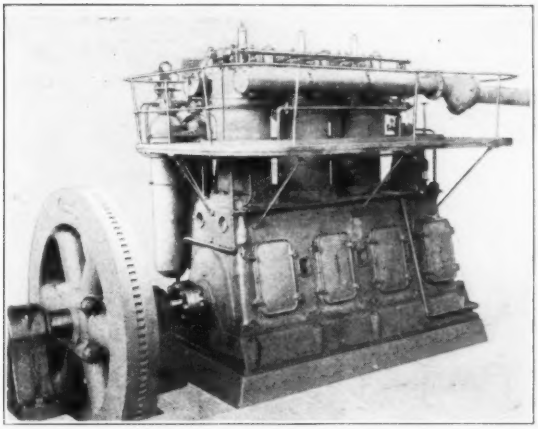
Type "A", 500 B. H. P., 164 R. P. M.

In this article it is assumed that the reader is familiar with the high compression four-stroke cycle of the true Diesel Type Engine, as explained in the November issue of *Lubrication*, and the writer will merely attempt to give a brief outline of some of the salient features of this type of engine as manufactured by the McIntosh & Seymour Corporation.

In the stationary type, to which this article will be confined, the Corporation is building a line of engines ranging from 50 to 1000 B. H. P. capacity. Most of these engines are of the box frame type—as illustrated—but the A frame type is also very successful, being preferred by some engineers as appearing to be slightly more accessible. The box frame, which rests on the base plate, is provided with doors for removing the reciprocating parts and with hand holes for inspecting the main bearings while the engine is in operation.

These engines are multi-cylinder, ranging from one cylinder for the 50 H. P. size to six cylinders for the 1000 H. P. unit. The air compressor, either two- or three-stage, depending on the size of the engine, is mounted on the frame at the rear of the working cylinders, and is driven from the crankshaft by an overhung crank. The air compressor charges the three flasks on the valve gear side of the engine with compressed air for starting and for fuel injection. An extra flask is provided as a reserve supply.

The piston is of the trunk or crosshead type, made of cast iron and fitted with snap rings of the same material. The connecting rods are steel forgings, with babbitted boxes amply lubricated. The cylinders are set on the frames, and form the outside of the cooling water jackets; cast iron liners are placed inside the cylinders and are very accurately bored to fit the pistons. On the main



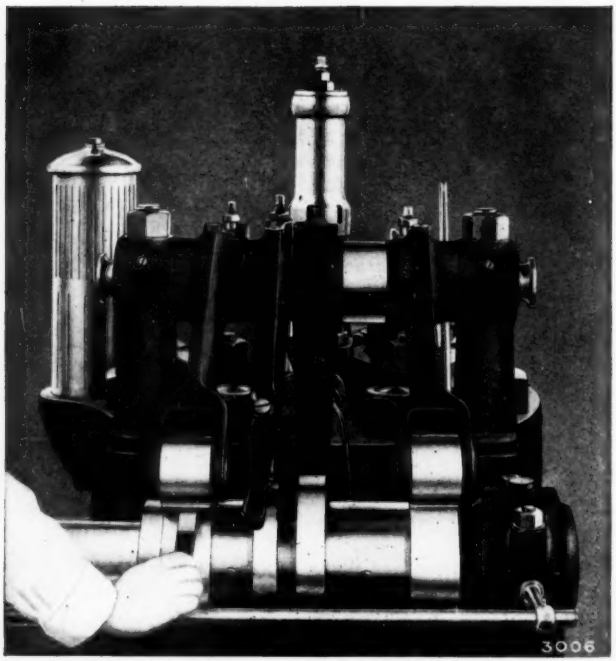
Type "B", 285 B. H. P., 200 R. P. M.

cylinders large rectangular openings are provided between the cylinder head studs. Corresponding openings in the cylinder head permit the flow of cooling water from the cylinder jacket, insuring very effective cooling of the head in general, and the exhaust valve in particular.

The illustration on the next page shows one of the cylinder heads with the valves and valve operating levers in place. These levers are operated from the camshaft, which is driven by means of spiral gears from the upper end of the governor shaft. The lever on the left is that which operates the air intake valve. To the left of the air valve is the air intake muffler, through the slots in which the air is taken for the working cylinder. As this cut shows the cylinder head next to the flywheel, it also shows the operating lever for the air starting valve. The cam roller on this lever has a lateral movement on its pin, so that by means of the starting handle the roller may be moved to either an operative or inoperative position on the cam, as desired. The central lever is the fuel valve lever which opens the fuel needle when the piston is a few thousandths of an inch before the top of compression stroke. The exhaust valve lever is on the right, and is similar to the air inlet lever.

These levers are carried on a pin which is mounted on supports. By removing the caps on these supports and putting a sling around the grooves in either end of the pin, all the valve levers may be lifted out of place at once—leaving the valves free for inspection. In the illustration, the operator is measuring clearance between the air inlet cam and its roller.

The fuel pump on these engines is of the variable stroke type, driven by eccentrics on the governor shaft. There is a separate pump for each cylinder on the engine. The stroke of these pumps is controlled by the governor, so that just enough fuel is delivered to the cylinders to carry the load on the engine at normal speed.



Cylinder Head Showing Valves and Valve Operating Levers in Place

The following test results were achieved with a standard 500 B. H. P. Type A engine in the Corporation's erecting shop:

Percentage of rated load	25.6	51.0	75.8	99.6	114.8
Revolutions per minute	168	167	166	163	168
Brake Horse-power	128.2	255	379	498	574
Time of test in hours	½	½	½	1	1
Fuel consumption per B. H. P. hour .... Lbs.	.584	.432	.396	.393	.388
Injection pressure ..... Lbs.	750	775	800	800	900
Exhaust gas appearance	Clear	Clear	Clear	Clear	Clear
Inlet temperature of cooling water . . . Deg. F.	69	69	69	69	69
Outlet temperature of cooling water . . Deg. F.	150	150	158	158	158
Temperature in testing room ..... Deg. F.	73	73	72	78	79

Good lubrication is an essential element of high mechanical efficiency. A force feed lubricator is placed on the valve gear side of the engine and is operated by means of an eccentric and rod from the camshaft above.

This multiple feed lubricator supplies oil for the crank pin and piston pin bearings, both for the working cylinders and the air compressor. It also supplies the governor shaft bearings and the main cylinders with lubricating oil.

The air compressor piston is oiled with a high pressure lubricator. The main bearings, camshaft and bearings are oiled by chains which run in grooves cut in the bearings. These chains carry oil to the top of the journal and from there it is distributed evenly by means of oil grooves. The main bearings are each provided with two chains, while the camshaft bearings require but one.

The engines just described are suitable for direct connection to alternating or direct current generator, centrifugal pumps, refrigerating machines, etc., as well as for belt or rope drive to a line shaft. A thermal efficiency of over 33 per cent and a mechanical efficiency of over 80 per cent renders this type of engine, as manufactured by the McIntosh & Seymour Corporation, a most economical prime mover.

TEMPERATURE CONSIDERATIONS IN OIL TESTING

The tests which describe the physical characteristics of oil are, with very few exceptions, of little or no value to the user of lubricants. These exceptions are very important, however, and the way in which the results of these tests are quoted or the specifications for those indicated, frequently adds to the confusion and takes away from those which are important any of the possibilities of proper comparison.

It is true that there is frequently little understanding as to the way in which these tests should be made, and the consequence is that the results of different laboratories show a variation which destroys any possibility of comparison. Not only is this the case, however, but there appears to be a general lack of understanding as to the effect of temperature upon some of these tests and the importance of quoting the temperature which would bring the results back to the standard usually adopted.

It is, of course, well known that oil expands with heat and contracts with cold, so that the actual volume of a given weight of liquid at summer temperature is considerably more than the actual volume of the same weight of liquid at winter temperature. It follows naturally from these conditions that the weight of a gallon of a certain oil at summer temperature is less than the weight of a gallon of the same oil at winter temperature, so that if a hydrometer be used to determine the gravity of the oil under the summer conditions it will show a different result from the gravity reading of the same oil under the latter conditions. Despite this fact, gravity is mentioned time and again in articles written for engineers, in books and articles for the motor owner, and in discussions on the value of oil tests, without any reference being made to the temperature at which the gravity has been taken or the temperature to which it has been corrected; so that the man who is unfamiliar with the testing of oil or its physical characteristics, both in the general lubricating and the motor field, gets the impression from many sources that gravity is a fixed and definite matter, that the gravity of an oil once known remains the same under all conditions.

In a book for the motor owner, which has a wide sale all over the country, the statement is made that gasoline of a certain gravity is the best. If the motor owner

who reads this book were to attempt to secure gasoline of that gravity from a refiner of oil, the product would not show the same gravity on his hydrometer readings, either in summer or winter weather, except when the temperature of the air was precisely at 60° F. at the moment his gravity reading was taken. As has been stated before, gravity is of little or no value to the user of oil unless he is comparing two grades of oil made from the same crude by the same refining process; but even in that case the comparison is impossible unless the gravity readings are both corrected so that they represent gravity which the oil would have at precisely 60° F.

In the analysis of an oil in the laboratory where the characteristics are to be secured without regard to any specification, the readings should always state the correction for temperature in the case of gravity so that it will be indicated that such readings have been based upon 60° F. and not upon the actual temperature at which the reading was taken.

Much more important, however, is the temperature indication in connection with viscosity of a lubricating oil. The viscosity of a lubricating oil is its most important characteristic in the consideration of its use for lubricating purposes, and this characteristic is generally used in the consideration of an oil for this work. Viscosities, however, are frequently quoted without any reference to the temperature at which the viscosity was taken, and inasmuch as there are a number of viscosimeters on the market on which the viscosity reading is taken at varying temperatures, the absence of the temperature notation makes any viscosity comparison impossible.

It is obvious that an oil, because of its expansion, will have a very different viscosity at 100° F. from that indicated with the same oil at 60° F. The usual temperature at which viscosity is taken, for engine and machine oils and similar lubricants, is 100° F., but there are a number of instruments in use at which the viscosity is taken at 60° F. When an oil is bought from a refiner having a viscosity of 300″ at 100° F., and the buyer's laboratory takes the viscosity on an instrument at 60° F., the results will vary sufficiently to make the discrepancy the subject of controversy unless the difference in the temperature is taken into account by the oil buyer so that a proper comparison can be made.

We frequently receive specifications from those buyers of oil who are still using viscosity limitation without mentioning the temperature at which this viscosity reading will be taken. The absence of this temperature indication necessitates a great deal of delay, and correspondence in the execution of an order, or perhaps a similar delay and correspondence after the oil is received, because of the fact that the buyer's specification has not considered that the viscosity was taken at a different temperature from that included in the general practice of the oil refiner. The practice of The Texas Company is to take the viscosity reading of a lubricating oil at 100° F. for engine, machine and other similar lubricants, and 210° F. for cylinder oils.

This same expansion and contraction of oil during changes in temperature sometimes leads to complaint from the customer as to the quantity of oil received in taking the gallonage in any package. In the sale of oil to its customers, The Texas Company

quotes and ships the gallonage as it is at 60° F. If this oil is received when the temperature is considerably higher than that, it will exceed the gallonage actually billed and ordered; and if it is received at a temperature lower than that, it will be less than the gallonage quoted and billed.

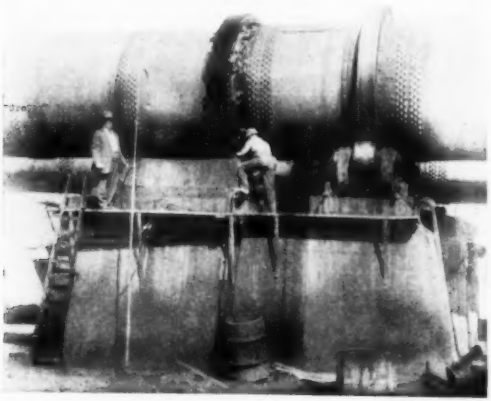
It is obvious that in selling oil by the customary method which has been established since the beginning of the oil business, that is by the gallon, it would be impossible to conduct this sale along any lines which would be fair to the oil buyer unless the gallonage were taken at a certain temperature and all quotations made and orders filled on that basis.

The fact of the matter is, that the temperature in connection with an analysis of the characteristics of an oil is of importance under all circumstances. Whatever may be the value of the tests as an indication of the practical working of the oil, there is no value in the use of any test unless the temperatures are considered and corrections made so that the comparison can be based upon the condition of the oil at the same temperature, eliminating the variations which the different temperatures must bring.

AN EXPLANATION

At the monthly meeting of the Crater Compound Club, held November 12, a statement was made that a company in Chicago operating a fleet of motor trucks had used twelve barrels of Texaco Crater Compound in four months.

The question was asked, "How could a company of that kind possibly use such an amount of Crater Compound?" It developed that this company uses Crater Compound not only as a chain and transmission lubricant, but whenever a truck is taken down and overhauled, in reassembling the parts wherever two pieces of metal come in contact a coating of Crater Compound is applied. They said they have found it to be the best preservative they ever used. They find it makes an exceptionally good lubricant and preservative for springs, bolts, and nuts. They state that in taking down parts of trucks where a coating of Crater Compound has been applied, no damage is found, as the Compound prevents any oxidation in the metal.



Crater Compound in action on the main-girth gear, which is 10½′ diameter, 12″ face, 3″ pitch. Kiln temperature 2800° F.

(See article on next page)

The Following Letters From The Southwestern Portland Cement Company Tell Their Own Story:

El Paso Texas, August 12th 1914.

Mr. A. F. Fegan,
Care The Texas Company,
El Paso, Texas.

Dear Sir:—Confirming conversation with you regarding use of "Crater Compound" on our kiln gears, beg to say that for two years we tried to lubricate them with yours and other black oils without much success.

At that time, two years ago, you put in your "Crater" and I doubted the advisability of attempting to run the main girth gear any longer, but am pleased to say that the wear was stopped almost completely by the use of "Crater." The same gears are running today with promise of a long time yet. **You can see the value of this, as this gear and pinion cost us about $600.00, without expense and loss of time in replacing.**

Our gear lubrication on kilns and coolers was reduced in cost over 50% by use of "Crater" in addition to the above benefits.

Yours truly
Southwestern Portland Cement Company,
By *O. J. Binford,*
Sec'y and Supt.

El Paso, Texas, Nov. 22, 1915

Mr. A. F. Fegan,
Care The Texas Company,
El Paso, Texas.

Dear Sir:—Referring to your conversation in connection with photographs taken recently of our kilns, showing the girth gear trains in operation, beg to state in reference to our letter of August 12th of last year, that the life of these gears was prolonged in addition to the two years referred to in that letter, some six to eight months.

The new gears, which we believe from past experience, lubricated with Crater Compound, should last four to five years, instead of about one to one and one-half years with any lubrication we have been able to discover other than Crater Compound.

Yours truly
Southwestern Portland Cement Company,
By *O. J. Binford,*
Sec'y and Supt.

These letters and the photographs are an interesting commentary on the high value of Texaco Crater Compound under severe conditions. The photograph on the previous page shows a close-up view of the gear mentioned. Observe the size of this gear. Think of the immense weight of this kiln, and remember the high heat—2800°—and you will get some idea of the severity of the service required.

We were able to save this Cement Company a considerable sum of money, when the cost of the gears, the saving in lubrication, and the reduction of labor are considered. No doubt you have gears, exposed bearings, or wire rope which could be benefited by the application of Texaco Crater Compound.

Let us know of them, let us show you how "Crater" will help.

Southwestern Portland Cement Company, El Paso, Texas. Rotary Kiln: 8′x150′, variable speed, ¾ to 2½ r. p. m. The driving gear train consists of four reductions, making a total reduction of 212 to 1; driven by 40 h. p. variable speed motor. The train is lubricated with Texaco Crater Compound.